REMOTE-CONTROLLED MONITORING ARRANGEMENT FOR AN ELECTRONIC OVERCURRENT TRIP DEVICE

Background Information

The present invention relates to an arrangement for monitoring and manipulating an electronic overcurrent trip device of an electric circuit-breaker by remote control, with the overcurrent trip device having an interface for outputting status messages and receiving control commands, and the interface being connected to a transmission line.

Various ~~embodiments of~~ remote-controlled arrangements ~~of the type mentioned in~~ the preamble have been made known. Examples include the ~~following patent publications:~~ German Patent 31 22 109 ~~C2,~~ U.S. Patent ~~3,918,566,A,~~ 4918566 and U.S. Patent ~~5,373,412,A.~~ 5373412 These arrangements use special data transmission protocols on the transmission line. Unless special local networks are used, the data can also be transmitted over power lines, if the arrangement concerned is to be used by the central load distribution system of a utility company for the remote control of service switches.

~~In practice, however, the~~ main concern is not only to connect the overcurrent trip devices of circuit-breakers to a central control room, but also to give the manufacturer a means for the central monitoring and remote control of circuit-breakers and corresponding overcurrent trip devices. The currently available arrangements can meet this requirement only at considerable expense, because either a separate data network must be set up to connect the individual circuit-breakers to the switchgear manufacturer, or at least the data formats must be repeatedly converted. ~~The~~ An object of the present invention is to provide a much more cost-effective and technically simpler means for maintaining circuit-breakers and overcurrent trip devices from a central control room.

According to the present invention, this object is achieved by ~~the fact that the transmission line forms an integral part of a network that connects data processing devices and the interface of the overcurrent trip device is programmed to exchange data in HTML format based on the TCP/IP protocol series.~~ This eliminates ~~the need for special~~ remote control bus systems (such as Profibus or similar systems) as is currently the case.

Data transmission using the TCP/IP protocol series for connecting computers (PCs) has been introduced worldwide via the Internet. As a result, PC-type data processing devices located anywhere in the world, including systems of different types, can be interconnected to exchange data. The HTML format used for this purpose enables information, i.e., data, to be entered and output directly, using other data sources or databases, regardless of whether they are connected directly to the data processing device in question or via the Internet.

Using a data transmission method based on the TCP/IP protocol series over an Internet connection enables the manufacturer of a circuit-breaker, for example, to check, on request, a circuit-breaker located anywhere in the world by interrogating its electronic overcurrent trip device and to transmit commands, ~~data, or modified parameters to the latter as needed. Despite the ability made possible in this way to access the overcurrent trip device properties of circuit-breakers worldwide, it is possible to provide a means for~~ preventing hazardous or unauthorized access. The simplest way to do this is to provide the overcurrent trip device with a switch that respectively enables or disables a modification of tripping parameters by transmitting data over the interface. This makes it possible to arrange, with the circuit-breaker operator, access by the manufacturer within a narrow time frame, thus preventing subsequent unauthorized access. Furthermore, encryption algorithms, passwords or similar security measures, like those employed for banking transactions over the Internet, can be used.

One page in HTML format contains a relatively small amount of data. According to the present invention, this fact is reflected in that at least one HTML page provided for retrieval is stored in a memory area of the overcurrent trip device. The advantage of this is that the scope of the data to be transmitted can be limited as needed. On average, this significantly saves memory space, considering the fact that one page is generally used for the largest data record needed.

Another advantage can be obtained by designing the above-mentioned memory area as a read/write memory area for retrieving and storing at least one HTML page. In this case, both the operator and the manufacturer, i.e., the maintenance personnel, of the circuit-breaker can store or replace modified HTML pages in the overcurrent trip device.

The present invention is explained in greater detail below on the basis of the embodiment illustrated in the figure.

The figure shows one circuit-breaker LS1 of a large number of circuit-breakers, a further circuit-breaker LS2, and a further circuit-breaker LSn, omitting the sequence numbers immediately following second circuit-breaker LS2. Each of these circuit-breakers has an overcurrent trip device U1, U2, and Un, respectively, which is equipped with an interface S1, S2, Sn. These interfaces connect circuit-breakers LS1, LS2, and LSn to networks NW1, NW2, which are formed by local segments of the Internet. The figure shows that parts of network NW1 and NW2 can be separated by great physical distances and can, for example, be located on different continents. In the illustrated example, they are connected to a satellite S via antennas A1 and A2, with satellite S ensuring that the connection is continuously available.

Any number of data processing devices in the form of personal computers PC1, PC2, etc. are connected to network NW1 and NW2. These data processing devices can belong to the operators of circuit-breakers LS1, LS2, etc. or to the manufacturers of these circuit breakers. An external modem M or a corresponding

internal modem card makes it possible to exchange data between a universally accessible public telephone network and the Internet.

A situation is described below in which a circuit-breaker operator would like to have the manufacturer check the corresponding overcurrent trip devices and modify parameter settings, if this appears to be necessary. One way to do this is for the operator to send a message to the manufacturer in writing, over the telephone, or over network NW1 and NW2, respectively. In this message, the operator states the period of time during which he would like the maintenance work to be carried out, or expresses his willingness to make the overcurrent trip devices available for data transmission over network NW1 and NW2, respectively, on request at a specific point in time. Using his data processing device, e.g., PC1, the manufacturer then contacts the operator's electrical system in the same manner, by entering an Internet address, as is common practice with other Internet-based information and data services. By ~~selecting~~ the correct overcurrent trip device U1, U2, etc., the manufacturer now receives a list of the recorded procedures on his screen. The scope of this record depends on the requirements of the operator and/or the manufacturer and requires the overcurrent trip device to be equipped with a data memory. Data that could be useful in the present situation can be, in particular, tripping events with an indication of the overcurrent value. The manufacturer can now use the data stored in data processing device PC1 or an external database DB to determine whether the tripping events lie within a preset range or whether it is appropriate to set modified tripping parameters, taking into account the configuration of the operator's system. If the parameters can be set, the manufacturer can now program overcurrent trip device U1 directly by transmitting a modified set of parameters. For operator security purposes, the changes made can be confirmed or logged for the operator, allowing the operator to interrupt any further access and thus prevent other changes from being made to parameters. Conversely, the manufacturer can be granted continued access so that he can

make sure that the changes made to the set parameters were effective, i.e., had the desired effect.

The above-mentioned display that appears on the screen of data processing device PC1 during the maintenance work is preferably at least one page in HTML format that is retrievably stored in a memory area of the selected overcurrent trip device, e.g., memory area SP1 in overcurrent trip device U1 of circuit-breaker LS1. This HTML page forms the framework and the user interface for reading and modifying data. The circuit-breaker user himself can provide the HTML page, thus specifying which data is accessible for the maintenance work. According to another possible configuration, the manufacturer of the circuit-breaker, i.e., the maintenance personnel entrusted with the work, provides the HTML page and replaces or modifies it as needed during the course of maintenance work. This is made possible by the fact that the memory area is designed as a read/write memory area, and write mode is enabled, i.e., can be enabled by transmitting a password.